

Traditional and Vernacular Architecture in Bali

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Abstract The study of Bali's traditional and vernacular architecture requires a comprehensive interdisciplinary approach to reveal the complex expressions of this culturally diverse island. Influenced by Hindu, Buddhist and indigenous beliefs, Bali's architecture is closely interwoven with its lush landscape, characterised by terraced rice fields, volcanic mountains and a tropical climate. The theoretical foundations are based on vernacular architecture and emphasise the importance of indigenous knowledge, local materials and cultural, social and environmental factors. The study focuses on the classification and functions of more than 20,000 Hindu temples or "pura", which reflect the island's deep cultural roots and rituals based on the Balinese calendar. An examination of small villages such as Pengotan reveals a nuanced architecture with sacred and profane zones clustered around temple areas, residential areas and cemeteries. The concentration of family units in sacred spaces and the meticulous adherence to the luan concept reveal the intricacies of traditional Balinese architecture. However, the preservation of this architectural heritage is being challenged by rapid modernisation and a booming tourism industry. The influx of tourists, which has increased from 2.5 million in 2010 to 14 million in 2017, poses a threat to Bali's traditional building practices and materials. The environmental impact of increasing waste and inadequate infrastructure, exacerbated by the growing number of foreign visitors, requires sustainable planning. The government's ambitious goal of creating '10 new Balis' to double the number of tourists raises concerns about environmental protection and proper waste management. The methodological approach of this study is deeply rooted in vernacular architecture and aims to decipher the nuances and preserve Bali's architectural heritage. Balancing the demands of modernisation and tourism with the need for environmental sustainability is critical to the protection of the heritage.

Index Terms— Vernacular Architecture, Bali, Tourism, Traditions

I. INTRODUCTION

Bali, an island renowned for its captivating beauty, is not merely a tropical paradise but also a cradle of architectural heritage that has evolved over centuries. This study embarks on a captivating journey into the intricate realm of traditional and vernacular architecture in Bali.

The architectural landscape of Bali is a testament to the island's unique cultural and environmental context. Rooted in a tapestry of Hindu, Buddhist, and indigenous Balinese traditions, it reflects the deep spirituality and reverence for nature that defines the island. Bali's architecture is not merely a collection of buildings; it is an embodiment of the island's profound cultural wisdom and deep-seated connection to its environment. This paper endeavors to shed

light on the intricacies of this architectural identity, exploring its rich history, indigenous knowledge, and the challenges it confronts in the face of rapid modernization, tourism expansion, and environmental concerns.

At the heart of this exploration lies the theoretical foundation of vernacular architecture, which underscores the significance of indigenous knowledge, local materials, and cultural factors in shaping architectural forms. This perspective directs our attention away from grand monuments to the architecture of daily existence, capturing the essence of ordinary people's lives and their architectural expression.

The architecture of Indonesia, a confluence of religions, shines with stories of various colonizations. Indonesia has always been a vibrant center for sustainable, earth-quake-prone settlements. These traditional settlements are strongly influenced by the tropical environment, the socio-spatial organization and the prevalent rice farming culture in the

region. Indonesian vernacular architecture is continuously evolving in line with anthropology and daily life.

For example, on the Sumatra Islands, in the ethnic area of Indonesia, a traditional dwelling stand as a cultural manifestation of an era. This is characterized by ancestral knowledge and practices that have been passed down from one generation to the next, linked by a unique matrilineal lineage. At the heart of these teachings is the concept of sustainability, characterized by features that are now referred to as tropical architecture

A "nagari" consists of several individual units, all sharing a shopping center in the middle, the plans of which were carefully laid out by the ancestors. The ancestral houses, called "rumah adat", were built with specific features that complement the lifestyle of the people who focus on subsistence farming.

These houses are built on stilts to protect the stored produce from moisture and termites. Stilts regulate the temperature inside by allowing in the hot and humid monsoon winds of the region. The simple structure incorporates a post, beam and lintel system that transfers the load directly to the ground, with non-load bearing timber or bamboo walls. A traditional combination of wood and bamboo construction is used with the help of straw material such as coconuts, leaves, grass or rice straw. Loosely connected wooden pins and mortise and tenon joints allow the structural frame to absorb the shock waves of natural disasters.

Bali's architectural heritage stands at the crossroads of preservation and transformation, facing challenges from the swift modernization and the burgeoning tourism industry. The influx of visitors and the demand for contemporary amenities often collide with the preservation of Bali's architectural treasures. Furthermore, the island's susceptibility to climate change and natural disasters presents a critical threat to these structures, demanding strategies for their adaptation and resilience.

In essence, Bali's architectural heritage represents more than just a visual delight; it encapsulates a profound cultural and environmental narrative. My exploration seeks to uncover this narrative, acknowledging its significance and challenges while providing insights into how it can be preserved and adapted in the ever-changing contemporary world. Bali's architectural heritage is not a relic of the past but a living testament to the enduring interplay of culture, tradition, and environment, calling for dedicated efforts to safeguard its legacy [1].

II. LITERATURE REVIEW

Vernacular architecture is an area of study that delves into the built environment created by ordinary people in their everyday lives, reflecting their culture, traditions, and practical needs.

The investigation of traditional and vernacular architecture in Bali is rooted in numerous case studies and research endeavours. For illustrative purposes, this paper utilises the case studies titled "Preservation of the manifestation of

Balinese cultural traditions in the current architecture of public buildings: a case study of the Mandala Agung building of the Puri Ahimsa resort in Mambal Village – Bali" [2]

The cultural, social, and environmental context of Bali forms the backdrop for the examination of traditional and vernacular architecture. Bali, a predominantly Hindu island in the midst of the Muslim-majority archipelago of Indonesia, boasts a unique blend of cultural influences that have significantly impacted its architectural expressions. The island's architecture reflects a synthesis of Hindu, Buddhist, and indigenous Balinese beliefs and practices, creating a distinctive architectural identity. The physical landscape, characterized by lush rice terraces, volcanic mountains, and a tropical climate, has shaped the architectural responses of the Balinese people, adapting to both natural and cultural elements.

Despite its cultural richness, traditional and vernacular architecture in Bali faces a multitude of challenges. One of the most pressing issues is the rapid pace of modernization and the expansion of the tourism industry. These factors exert significant pressure on traditional building practices and materials. The influx of tourists and the demand for modern amenities often clash with the preservation of Bali's architectural heritage. Additionally, the island's vulnerability to climate change and natural disasters presents a critical threat to these structures. Rising sea levels, increased rainfall, and the potential for volcanic eruptions pose substantial risks to the continued existence and sustainability of traditional Balinese architecture.

The theoretical framework underpinning this study is firmly rooted in the concept of vernacular architecture. Vernacular architecture places importance on the architectural expressions of ordinary people in their everyday lives. It acknowledges the role of indigenous knowledge, materials, and techniques, as well as the influence of cultural, social, and environmental factors in shaping architectural forms. The vernacular architecture perspective directs our attention away from grand monuments to the architecture of daily existence and the culturally and environmentally responsive buildings that exemplify the lives of ordinary people.

Vernacular architecture is not a relic of the past but a living tradition that adapts to contemporary needs and influences. The term "vernacular transformations" encapsulates the idea that vernacular architecture continually evolves while maintaining a connection to its cultural roots. This notion is particularly relevant in an era of rapid urbanization and globalization.

Tourism in Bali, as discussed in the article "Towards Sustainable Tourism in Bali - A Western Paradigm in the Face of Balinese Cultural Uniqueness", significantly influences the island's architecture. The surge in tourist numbers, driven by Bali's natural beauty and vibrant cultural heritage, has caused notable alterations in the built environment. Nonetheless, the challenge is to harmonize the requirements of Western tourism paradigms with the

conservation of Balinese cultural distinctiveness. The article highlights the significance of sustainable tourism practices to curb environmental impact and uphold the authenticity of Balinese architectural heritage. As Bali faces challenges in managing the surge of tourists and modernisation, it is essential to strike a concordant equilibrium between tourism-driven growth and cultural preservation, ultimately guaranteeing the sustainability of the island's tourism industry and architectural heritage in the long run. [4]

The literature reviewed here underscores the importance of recognizing vernacular architecture as a dynamic and adaptable phenomenon. It is an architecture that is shaped by the practical requirements of its users while maintaining a deep-seated connection to local culture and tradition.

The study of vernacular architecture offers a profound understanding of the architectural expressions of ordinary people.

III. METHOD

First, I will provide an overview of Bali, a destination known for its rich cultural heritage. Bali's cultural tapestry is composed of a complex range of living traditions and artistic expressions. The island's architecture is an inspired blend of religious influences, with Hinduism playing a central role. The Sambal Village and the Pentagon Village, two small hamlets, illustrate this interplay of religions in their buildings and show the coexistence of Hindu and indigenous beliefs. However, Bali's architectural history is influenced not only by spirituality but also by tourism. The island's popularity as a tourist destination has transformed the architectural landscape, with demand for hotels, resorts and entertainment facilities causing changes to the traditional structure. The surge in tourist numbers presents a twin-fold prospect of economic growth and cultural dilution, necessitating a nuanced approach towards achieving the right equilibrium. The intricate interplay between the ever-changing patterns of global tourism and Bali's rich cultural identity underscores the complexity of this challenge. Maintaining this balance is paramount to Bali's sustainable development, as it must safeguard the island's cultural heritage while catering to the ever-increasing tourist footfall. The intricate interplay between the ever-changing patterns of global tourism and Bali's rich cultural identity underscores the complexity of this challenge.

IV. RESULT AND DISCUSSION

The study of traditional and vernacular architecture in Bali necessitates a comprehensive and interdisciplinary approach to uncover the rich architectural expressions of this culturally diverse island. Bali, an Indonesian island, represents an exceptional confluence of cultural, social, and environmental factors that have profoundly influenced its architectural heritage. Bali's architecture is characterized by

its unique blend of Hindu, Buddhist, and indigenous Balinese beliefs and practices. The island's lush landscapes, including terraced rice fields, volcanic mountains, and tropical climate, have played a pivotal role in shaping architectural responses.

The theoretical underpinning of this study aligns with the paradigm of vernacular architecture, which places a spotlight on the architectural expressions of ordinary people in their day-to-day lives. This perspective underscores the significance of indigenous knowledge, local building materials, and techniques, while also recognizing the influence of cultural, social, and environmental factors in shaping architectural forms.

A Balinese architect strives to design a sacred place in the way he believes is necessary for harmonious and balanced energy. Therefore, Balinese priests also preserve the knowledge and guidelines for Balinese architecture. For example, a building to be built in Bali and legalised in the official regulations must not exceed the height of a coconut tree (15 metres). [4]

Bali's architecture is not only famous in Asia, but also recognised as a style worldwide. It combines a stylish tropical lifestyle with traditional elements to create a unique atmosphere. Most hotels, restaurants, commercial villas and private residences are inspired by both Balinese elements and contemporary architectural concepts. This is evident in the aesthetics and use of Balinese building materials, art and craftsmanship. [4]

The art of Balinese architecture continues to evolve, while influences from different parts of the world can be found in many hotels, restaurants and other public facilities. All of these millennia-old influences seem to come together in harmony on this magical island. [4]

Many buildings in Bali are designed according to the principles of a 'sacred site'. Houses are built to face the rising sun or the nearest volcanoes. [4]

Balinese architects began to show a certain boldness in their design, giving it a modern touch. The influence of European styles can be seen in some old buildings built around the 1940s in North Bali, such as Bungkulan and Singaraja. [4]

There are more than 20,000 Hindu temples in Bali, known as "pura". The Pura (Balinese temple) is constructed as an open-air complex, enclosed by walls and accessible only through elaborately carved gates. The Balinese temple usually contains the padmasana - a throne for worshipping the Balinese supreme god, Sang Hyang Widhi; the pelinggih meru - a tower with stepped roofs similar to Nepalese or Japanese pagodas; various pavilions; and a storehouse for the temple's relics. [5]

Each temple has a specific function and ritual to follow based on the 250-day Balinese calendar year. The Balinese Hindu temples are categorized according to their physical and spiritual aspects - from Pura Tirta, the water temples, used for cleansing rituals, to Pura Segara, the sea temples, located by the ocean to placate the sea Gods and deities. Village and family temples in Bali play a significant role in Balinese culture and traditions, as they offer spaces for the community to gather and celebrate various festivities. [5]

If I examine the small villages of Bali more closely, traditional elements and architecture become more apparent. For instance, Pengotan village exhibits a pattern that extends from the kaja (sacred) to the kelod (profane), encompassing three distinct zones. The formatting will adhere to standard academic practices. These zones consist of the Utama (sacred zone), which is designated for temple structures, the Madya (transition/between space) area for residential purposes, and the remainder of the village located in the kelod section. Technical abbreviations will be explained upon first use. The language chosen will be objective, value-neutral, and grammatically correct. Housing units and the Nista Zone, which is designated for the Setra graveyard, are present. The idea of luan (sacred) orientation is often demonstrated in the "home garden" unit. Pengotan villagers' residential units are arranged linearly with the main road of the village serving as the axis for the linear spatial arrangement. [2]

A group of residential units comprises a few family leaders who are related to each other. Technical terms are explained upon their first use. Each family unit consists of three zones, which are tegak sanggah (a sacred space), tegak umah (a living area below the building), and bale. A family unit yard comprises of both a building and an empty land or multifunctional area known as tegak teba. The yard is oriented towards luan (kaja / Tuluk Biyu Temple) for its sacred purpose, and towards teben (house yard) for its profane purpose. The luan orientation marking system of the home garden unit holds sacrosanct value and it is inclined towards worshipping kaja, which is located in the Tuluk Biyu Temple. [2]

Additionally, one of the indicators of orientation is the occupant's sleeping position with their head facing kaja, also located in the Tuluk Biyu Temple. Lebu (profane) represents the lowest direction in the luan (sacred) and teben (profane) concept. The orientation of teben (sacred) is distinguished by its opposite direction to teba (profane) and lebu (profane). Direction is utilised as a ceremonial activity within the cosmic realm of Bhuta, representing the physical element of the universe. [2]

With Bali relying heavily on tourism, architecture plays a crucial role on the island. A visually appealing environment attracts significant crowds, as tourists are naturally curious about new cultures and fascinated by the new world they are entering. Architecture on the island functions as a form of communication - a sign to the outside world and an immersive experience for those inside. It serves as a medium to convey the essence and symbolism of the place, offering a glimpse into the rich history of the island. In this context, Balinese architecture becomes a representation of the local culture and lifestyle, encapsulating the spirit of its inhabitants. [7]

The preservation and comprehension of traditional and vernacular architecture in Bali present a host of challenges. Among the most pressing concerns is the rapid pace of modernization and the burgeoning tourism industry. Bali's architectural heritage, deeply rooted in tradition and heritage, frequently clashes with the demands of a rapidly evolving world.

The importance of architecture in Bali is paramount given the island's reliance on tourism. An attractive environment attracts large crowds, and tourists, driven by curiosity about different cultures, find themselves admiring the novel world they encounter. In this context, Balinese architecture becomes a crucial communicative medium - externally signalling the island's appeal and internally providing a realm of experiential richness. It functions as a symbolic representation of place, offering insights into the island's history. In this way, Balinese architecture serves as a tangible embodiment of the local culture and lifestyle, encapsulating the essence of the island for both external observers and those immersed in its unique world.

The influx of tourists and the need for modern amenities exert considerable pressure on traditional building practices and materials. Furthermore, Bali's vulnerability to climate change and natural disasters constitutes a significant threat. Rising sea levels, increased rainfall, and the looming potential of volcanic eruptions necessitate adaptation and preservation strategies to safeguard its architectural legacy.



Fig. 1. Number of foreign tourist arrivals to Bali, Indonesia from 2008 to 2023

The influx of overseas visitors to Bali rapidly increased from 2.5 million in 2010 to 5.7 million in 2017. Following this achievement, the government pledged to duplicate the feat by launching "10 new Balis" with the purpose of doubling tourist numbers to 20 million by 2019. To achieve the target, the government intensified its transportation infrastructure development and promotion endeavors. In 2017, the number of tourists reached the mark of 14 million. [8]

However, achieving success through increased numbers also presents challenges. The environmental infrastructure, including water and waste treatment, remains insufficient in most areas of Indonesia. The growing number of foreign tourists increases the infrastructure gap because their consumption is higher than that of a typical Indonesian. To wit, the increased use of plastic bottles, since tap water is typically not safe to drink. Improperly disposed waste originating from land is a primary contributor to Indonesia's position as the world's second-largest producer of plastic marine pollution. Furthermore, Indonesia has the highest number of coral reefs in the Asia-Pacific that are contaminated with plastic waste (Lamb et al., 2018). Beaches in Bali regularly require cleaning due to waste carried by the ocean. [6]

Improving infrastructure would enhance the sustainability of tourism, allowing it to be further developed in a sustainable manner. Better planning, particularly at the destination level, can facilitate the management of tourist influxes. Concentrating on attracting high-spending visitors could also reduce the strain whilst maintaining economic advantages. [6]

Preserving the environment and promoting tourism can complement each other. Tourists are drawn to Indonesia's environmental richness, and it is crucial to conserve these assets to maintain Indonesia's brand and attract more visitors. Forests, for instance, require protection as deforestation can impact not only tree and wildlife populations but also the economic gains derived from their tourism potential. [6]

The methodological approach for the study of traditional and vernacular architecture in Bali is firmly rooted in the theoretical framework of vernacular architecture. Bali's architectural heritage stands as a living testament to the enduring interplay of culture, tradition, and environment, and our methodological approach is dedicated to unraveling its nuances and preserving its legacy.

V. CONCLUSION

In conclusion, the study of traditional and vernacular architecture in Bali unveils a captivating tapestry of cultural, social, and environmental influences that have shaped the island's distinctive architectural heritage. Bali stands as a unique convergence of Hindu, Buddhist, and indigenous Balinese beliefs, all intricately woven into the fabric of its architectural expressions. The lush landscapes, including terraced rice fields and volcanic mountains, have been pivotal in influencing the architectural responses that reflect harmony with the natural surroundings.

The theoretical foundation of the study, anchored in the paradigm of vernacular architecture, highlights the significance of indigenous knowledge, local materials, and techniques. It underscores the interplay of cultural, social, and environmental factors in shaping architectural forms, with Balinese architects dedicating themselves to creating spaces that embody harmonious and balanced energy, guided by sacred principles passed down through generations.

Bali's architecture, renowned not only in Asia but globally, seamlessly integrates traditional elements with contemporary concepts, resulting in a unique and stylish tropical lifestyle. The island's architectural evolution, influenced by various global styles, maintains a harmonious blend, exemplifying the resilience and adaptability of Balinese architects.

The Balinese temple, or "pura," stands as a testament to the island's spiritual and ritualistic aspects, categorized based on their physical and spiritual functions. The role of village and family temples in Balinese culture is paramount, serving as spaces for community gatherings and celebrations, deeply ingrained in the 250-day Balinese calendar year.

Examining the traditional elements in small villages like Pengotan reveals a meticulous pattern of sacred and profane zones, showcasing the Balinese people's deep connection with their cultural and spiritual roots. The linear spatial arrangement of residential units, oriented towards sacred purposes, reflects the profound influence of luan (sacred) orientation on Balinese architecture.

With tourism playing a crucial role in Bali's economy, architecture becomes a vital communication medium, both externally attracting visitors and internally providing an immersive experience into the island's rich history and culture. However, the rapid pace of modernization and the surge in tourism pose challenges to preserving the island's architectural legacy.

The influx of tourists, as evidenced by the significant increase in arrivals, has strained traditional building practices and materials. Moreover, Bali faces environmental threats from climate change and natural disasters, necessitating adaptation and preservation strategies to safeguard its architectural heritage. The government's ambitious goal to double tourist numbers presents infrastructure challenges, particularly in waste management and conservation.

The study emphasizes the need for sustainable tourism development, proposing better planning at the destination level and attracting high-spending visitors to reduce the environmental impact. The intricate interplay of culture, tradition, and environment in Bali's architectural heritage underscores the importance of a methodological approach firmly rooted in the theoretical framework of vernacular architecture. This approach is dedicated to unraveling the nuances of Bali's architectural legacy, ensuring its preservation for future generations.

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